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Indian Standard

SPECIFICATION FOR FIRE-RESISTANT HYDRAULIC FLUIDS

PART 2 INVERT EMULSIONS (WATER-IN-OIL) TYPE

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SPECIFICATION FOR FIRE-RESISTANT HYDRAULIC FLUIDS

PART 2 INVERT EMULSIONS (WATER-IN-OIL) TYPE

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(*Continued on page* 8)

Indian Standard
SPECIFICATION FOR FIRE-RESISTANT HYDRAULIC FLUIDS
PART 2 INVERT EMULSIONS (WATER-IN-OIL) TYPE

0. FOREWORD

0.1 This Indian Standard (Part 2) was adopted by the Indian Standards Institution on 12 April 1983, after the draft finalized by the Lubricants and Related Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 The use of fire-resistant hydraulic fluids is increasing due to a growing awareness of the dangers inherent in using mineral oils for applications where there is a fire risk. Out of the four types of fire-resistant hydraulic fluids, namely, dilute emulsions, invert emulsions, water glycols and synthetic fluids (phosphate esters); invert emulsions (water-in-oil) have found widespread use due to their low cost, their good performance in most types of pumps and also because they are generally compatible with seals, metals and other components found in hydraulic systems. Water-in-Oil emulsions consist of about 40 percent water dispersed in fine droplets in a continuous oil phase. The water imparts fire resistance, whilst the oil phase provides lubrication properties. The working temperature for these types of fluids are 5 to 60°C.

0.3 Other parts of this standard published so far are as follows:

(Part 1)-1983 Dilute emulsions for powered supports
(Part 3)-1983 Water glycol type
(Part 4)-1983 Phosphate esters type

0.4 Selection and use of the fire-resistant hydraulic fluids are covered in IS : 10531-1983* while determination of their fire-resistant characteristics is given in IS : 7895-1975†.

0.5 In the preparation of this standard considerable assistance has been derived from NCB Specification No. 570/1970 published by National Coal Board, U.K.

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*Code of practice for selection and use of fire-resistant hydraulic fluids.

†Tests for fire-resistant characteristics of hydraulic fluids used in mining machinery.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part 2) prescribes the requirements and methods of sampling and test for fire resistant hydraulic fluids, invert emulsions (water-in-oil) type suitable for use in hydraulic systems.

2. GRADES

2.1 The material shall be in two viscosity grades, namely, VG 68 and VG 100 — designated as HF-B 68 and HF-B 100 respectively.

3. REQUIREMENTS

3.1 Description — The material shall be a stable emulsion free from foreign matter, sediment and visible impurities. It shall not contain any ingredients injurious to persons using or handling it.

3.2 Composition — The material shall be composed of mineral oil, suitable emulsifiers and other additives like antiwear, etc, to have desirable stability as well as antiwear characteristics.

3.3 The material shall also comply with the requirements prescribed in Table 1 when tested according to the appropriate methods specified in col 5 and 6 of the table.

4. PACKING AND MARKING

4.1 Packing — The material shall be packed in suitable containers as agreed to between the purchaser and the supplier. Galvanized drums/barrels shall not be used for packing these fluids.

4.1.1 The containers, together with associated bungs, caps, seals and other fittings shall not be made from aluminium, magnesium or titanium nor from alloys containing these metals as major constituents. The containers and their fittings shall not be painted with aluminium paint.

4.1.2 The internal cleanliness of all containers before they are filled shall be of a high standard. Any coating of the internal surfaces of the barrels shall have no deleterious effect on the fluid.

---

*Rules for rounding off numerical values (*revised*).

TABLE 1 REQUIREMENTS FOR FIRE-RESISTANT HYDRAULIC FLUIDS-INVERT EMULSIONS (WATER-IN-OIL) TYPES

(*Clause* 3.3)

Sl No.	Characteristic	Requirement for		Methods of Test, Ref to	
		Grade HF-B 68	Grade HF-B 100	Appendix	(P :) Method of IS : 1448*
(1)	(2)	(3)	(4)	(5)	(6)
i)	Appearance	Whitish emulsion	Whitish emulsion	—	—
ii)	Kinematic viscosity in cSt, at 40°C	61·2-74·8	90·2-110	—	P : 25
iii)	Relative density at 15°/15°C	0·90 to 0·97	0·90 to 0·97	—	P : 32
iv)	Water content, percent by volume	37 to 43	37 to 43	—	P : 40
v)	Rust preventing characteristics	Shall pass the test after 24 h		—	P : 96 (*see* Note)
vi)	Fire resistance characteristics	Shall pass the test A, B and C		—	IS : 7895-1975†
vii)	Emulsion stability characteristics:				
	a) Emulsion stability at 70°C for 48 h				
	1) Free oil, ml, *Max*	3	3	A	—
	2) Free water, ml, *Max*	1	1		
	b) Emulsion stability at 27 ± 2°C for 1 000 h				
	1) Free oil, ml, *Max*	10	10	B	—
	2) Free water, ml, *Max*	2	2		
	3) Water content change at 125 ml and 425 ml level, percent, *Max*	5	5		
viii)	Pump wear test: Total ring and vane mass loss, mg, *Max*	500	500	—	P : ‡
ix)	Foaming stability, ml, at 24°C	Nil	Nil	—	P : 67

NOTE — In this test 330 ml of the fluid alone shall be used instead of a mixture of oil and water.

*Methods of test for petroleum and its products.

†Tests for fire-resistant characteristics of hydraulic fluids used in mining machinery.

‡Under preparation. Till such time ASTM D 2882-74 may be followed.

4.2 Marking — The containers shall be securely closed and marked with the name of manufacturer; name, type, grade and mass of the material; recognized trade-mark, if any; and with identification in code or otherwise to enable the lot of consignment or manufacture to be traced back; and the instructions for use.

4.2.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING

5.1 Representative samples of the material shall be drawn as prescribed in IS : 1447-1966*.

6. STORAGE

6.1 The material shall be stored and handled, strictly in accordance with the suppliers instructions.

APPENDIX A

[*Table* 1, *Sl No.* (vii) (a)]

TEST FOR EMULSION STABILITY CHARACTERISTICS AT 70°C

A-1. PROCEDURE

A-1.1 Two 100-ml graduated measuring cylinders (Crow Receivers) shall be filled with 97 ml of emulsion. Mouth of each test cylinder, shall be sealed by a piece of polyethylene film bound in place. They shall be allowed to stand with the top closed for 48 hours test duration at a temperature of 70 ± 2°C.

A-1.2 At the end of the test period, mean values of the following results shall be reported:

a) Volume of the top separated layer, and
b) Volume of the bottom separated layer.

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*Methods of sampling of petroleum and its products.

APPENDIX B

[*Table* 1, *Sl No.* (vii) (b)]

TEST FOR EMULSION STABILITY CHARACTERISTICS AT 27°C

B-1. PROCEDURE

B-1.1 A 500-ml graduated cylinder with the top closed to prevent evaporation shall be filled with 450 ml of emulsion over a 50 ml layer of water. After 1 000 hours storage, 50 ml sample shall be pipetted from the defined levels in the upper and lower region of the emulsion column. The water content of these samples shall be determined by IS : 1448 [P : 40]-1976* and compared with initial water content. Readings of surface oil layer volume and volume of accumulated free water shall be recorded.

B-1.2 At the end of the 1 000 hours test period the following results shall be reported:

a) Mean change in percent water content at 425 ml level,

b) Mean change in percent water content at 125 ml level,

c) Mean surface oil layer volume in ml, and

d) Mean volume of accumulated free water in ml.

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*Methods of test for petroleum and its products: P : 40 Water by distillation (*second revision*).

(*Continued from page* 2)

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Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1 \text{ N} = 1 \text{ kg.m/s}^2$
Energy	joule	J	$1 \text{ J} = 1 \text{ N.m}$
Power	watt	W	$1 \text{ W} = 1 \text{ J/s}$
Flux	weber	Wb	$1 \text{ Wb} = 1 \text{ V.s}$
Flux density	tesla	T	$1 \text{ T} = 1 \text{ Wb/m}^2$
Frequency	hertz	Hz	$1 \text{ Hz} = 1 \text{ c/s } (\text{s}^{-1})$
Electric conductance	siemens	S	$1 \text{ S} = 1 \text{ A/V}$
Electromotive force	volt	V	$1 \text{ V} = 1 \text{ W/A}$
Pressure, stress	pascal	Pa	$1 \text{ Pa} = 1 \text{ N/m}^2$

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